

# User Manual

**Node:** Wireless Triaxial Tiltmeter

**Model:** Version 2.1

**Manual Revision:** 1.3



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# 1 Introduction

## 1.1 Warning

This guide intends to assist in the preferred mounting, operation, and usage of Viotel’s Wireless Triaxial Tiltmeter Node.

Please read and completely understand this user guide in order to make sure the safe and correct use of the system as well as maintain the longevity of the device.

Protection provided by the equipment may be impaired if used in a manner contrary to this user manual.

Changes or modifications not expressly approved by Viotel Limited could void the user’s authority to operate the equipment.

This product must not be disposed of in the normal waste stream. It contains a battery pack and electronic components and so should be recycled appropriately.

## 1.2 Theory of Operation

The Wireless Triaxial Tiltmeter is a low touch Internet of Things (IoT) device. It is designed to be as simple as possible to install and activate — set and forget. Data is retrieved from the device via our cloud-based platform or via API to yours using the integrated LTE-M (CAT-M1) cellular communications. The device also uses LTE-M for time stamping to within 1 second for comparison of data between nodes.

The device sensor is always monitoring for events, and can be continuously monitoring, or set to a triggered state to upload data within seconds. Remote configuration is possible to change the acquisition and upload frequency via the myViotel device management tool or API.

## 1.3 Parts List

PART	QTY	DESCRIPTION
1	1	Wireless Triaxial Tiltmeter Node
2	1	Battery pack (will be pre-installed into the device)
3	1	Cap
4	1	Magnet

The diagram illustrates the components of the Wireless Triaxial Tiltmeter Node. Item 1 is the main device, which is a grey and pink ruggedized smartphone-style device with a screen displaying 'VIOTEL SMARTER DATA WIRELESS TRIAXIAL TILTMETER', a QR code, and 'viot 00944'. Item 2 is a black battery pack with a label that reads 'ENEPower FANSO NONRECHARGEABLE 2/ER34615H (2S) 7.2V 20Ah 144Wh LISOC12 Assembled in Australia (L843) (326947) (BA)'. Item 3 is a black cap that fits onto the bottom of the device. Item 4 is a small black magnet with a ring, used for mounting the device.

Table 1 Parts List

## 14 Dimensions

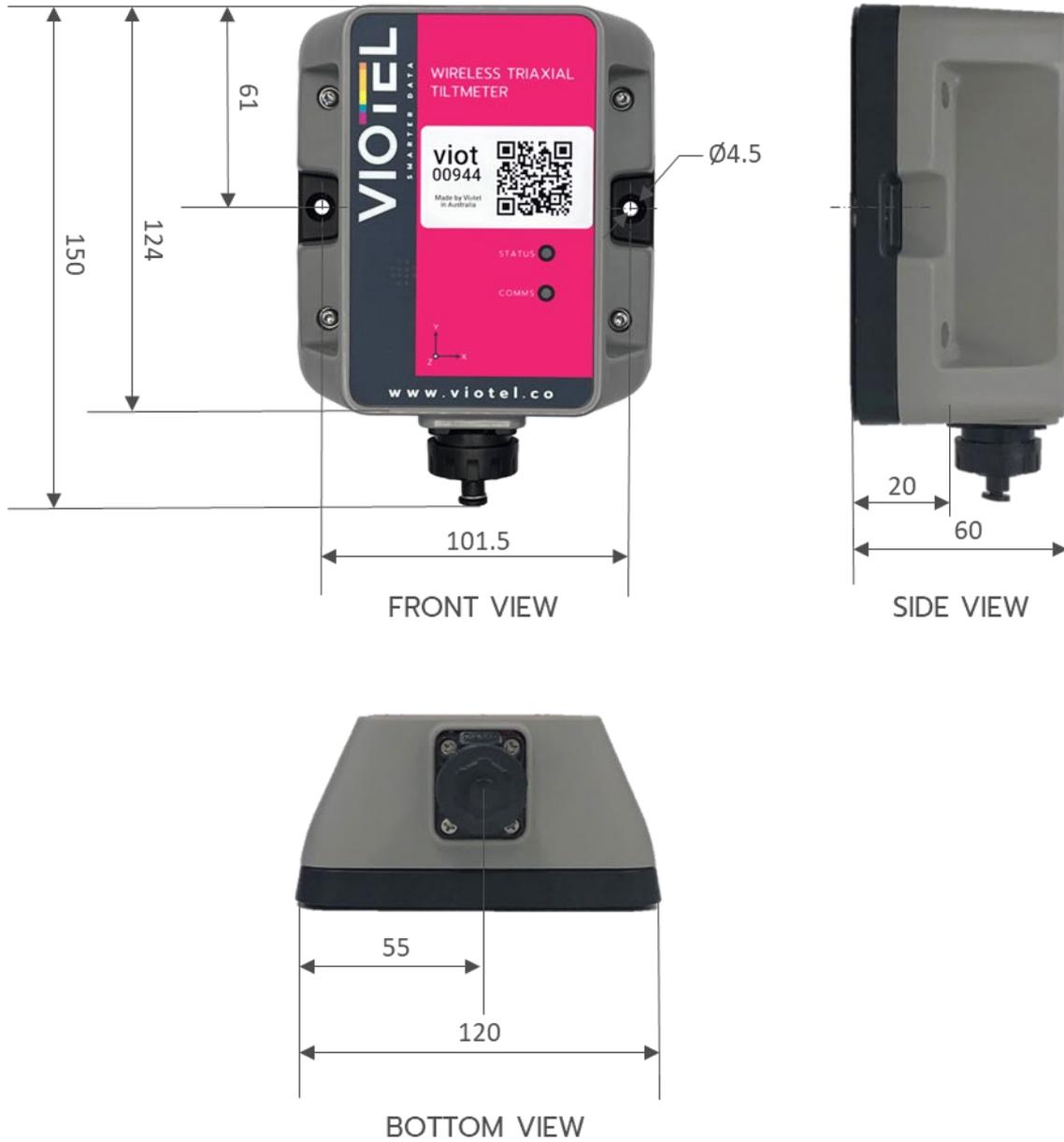


Figure 1 Dimensions in mm

## 2 Usage

### 2.1 Indicated Magnet Location

#### 2.1.1 TILT-V2.1-INT

The following instruction applies to TILT-V2.1-INT. These are devices with serial Viot00634 and above. A version 2.1 will have the decal as shown in figure 5 below.

The switch that the magnet (Part 4) operates on the Wireless Triaxial Tiltmeter (Part 1) is located directly over the “O” on the Viotel logo, as shown below.



Figure 5: Photo highlighting location of the magnet for TILT-V2.1-INT

**NOTE:** The above instruction applies to version 2.1 of Viotel devices which are those with serial number Viot00634 and above.

## 2.1.2 TILT-V2.0-INT

The following instruction applies to TILT-V2.0-INT. These are devices with serial Viot00634 and below. A version 2.0 tiltmeter will have the decal as shown in figure 6 below. The magnetic switch location is between the communication and status LED lights.



Figure 2 Photo highlighting location of the magnet for TILT-V2.0-INT

## 2.2 Required Tools

The following tools and consumables are suggested for installation. Hand tools specific to your installation scenario are to be selected by the installation. Viotel recommends for installation into masonry:

- Hammer drill + correct drill bit (nominally 6.5mm or 7mm).
- Drill
- 2x countersunk screw (nominally 8G or 10G, 50mm long)
- Suitable wall plugs

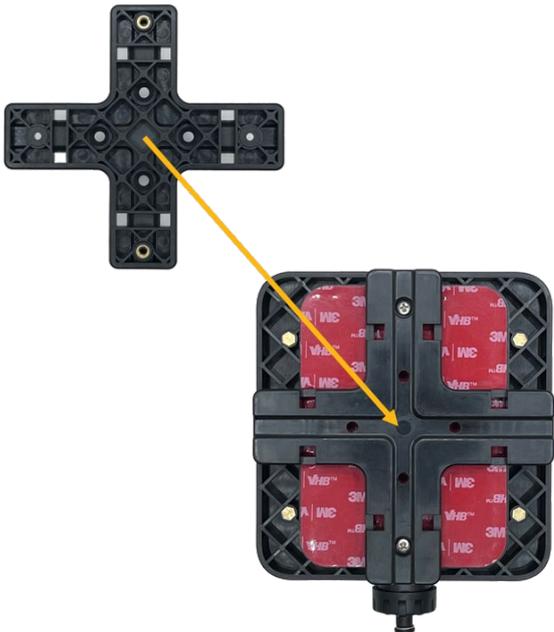
The following tools are required for changing the batteries.

- T10 Torx Screwdriver
- Thin Needle Nose pliers

Contact Viotel for any support required.

## 2.3 Mounting Options

Viotel's Wireless Triaxial Tiltmeter Node can be mounted in a number of ways. The following is a list of recommended methods.

MOUNTING	DESCRIPTION
<p><b>1. Side Mounting Holes</b></p>	<p>Side mounting points designed for M4 countersunk bolts or screws. Up to 10G countersunk screws will fit in the M4 bolt hole.</p> <div data-bbox="762 584 1134 958" data-label="Image">  </div> <p data-bbox="794 969 1114 999">Figure 3 Screw / Bolt Mount</p>
<p><b>2. Adhesive</b></p>	<p>The honeycomb backing plate provides the ideal surface area for use of fast grab adhesives. The Tiltmeter can be removed leaving only the backing plate in place. Replacement backing plates can be ordered from Viotel (item # VFN-001)</p>
<p><b>3. Pole Mount</b></p>	<p>Threaded M3 holes in the backplate suitable for <b>optional</b> pole mount bracket or mounting to a plate within an enclosure.</p> <div data-bbox="676 1285 1230 1917" data-label="Image">  </div> <p data-bbox="794 1928 1114 1957">Figure 4 Optional Pole Mount</p>

**4. Two-Sided Adhesive**

Clean and dry the mounting locations surface. Peel off the red plastic layer on the back of the node and firmly press it onto the required location. Keep the device and surface under this same pressure for approximately 20 minutes (to achieve 50% bond strength in room temperature). We suggest using this to assist with installation and in conjunction with a physical coupling (Method 1).



Figure 5 Adhesive sticker on rear of tiltmeter

Table 2 Mounting Options

## 2.4 Orientation Description

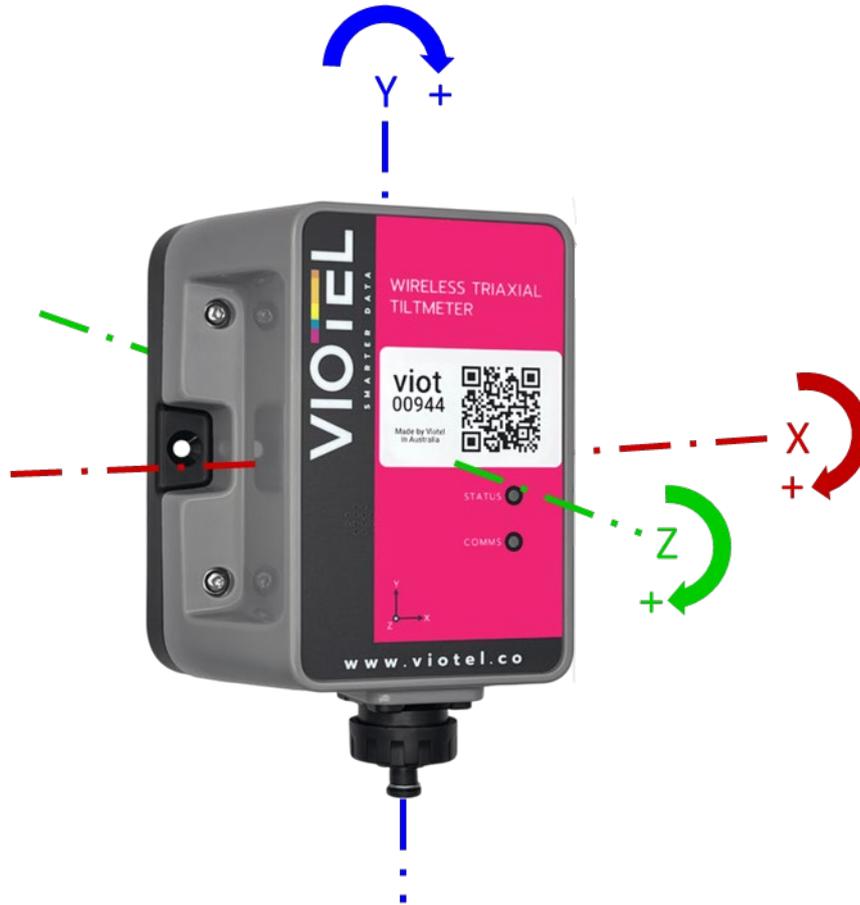


Figure 6: Photo showing X, Y, Z Axis Orientation

Figure 6 demonstrates the three internal orientation axes with respect to the Tiltmeter enclosure, where the positive end of each axis is annotated with the axis label. For example, the positive end of the x axis is at the right of the tiltmeter in the figure.

## 2.5 Rotation Description

Measurements made by the Tiltmeter are mapped to three angles calculated and displayed in the device's data section within the [myViotel](#) application. These are 'Angle between horizon and Z-axis', 'Angle between horizon and X-axis', and 'Angle between Upwards and Y-axis', and are explained below.

<p><b>Angle between horizon and Z-axis</b></p> <p>This ranges from -90 to 90 degrees. It measures the angle between the Z-axis of the device to the earth's horizon (the plane perpendicular to gravity). The below images demonstrate rotations in this angle when you look at it side-on if it was mounted portrait vertically on a wall, with connector pointing down.</p> <p style="display: flex; justify-content: space-around;"> <span>Negative Rotation</span> <span>Default Orientation</span> <span>Positive Rotation</span> </p>
<p><b>Angle between horizon and X-axis</b></p> <p>This ranges from -90 to 90 degrees. It measures the angle between the X-axis of the device to the earth's horizon (the plane perpendicular to gravity). The below images demonstrate rotations in this angle when it is facing you while mounted portrait vertically on a wall, with connector pointing down.</p> <p style="display: flex; justify-content: space-around;"> <span>Negative Rotation</span> <span>Default Orientation</span> <span>Positive Rotation</span> </p>
<p><b>Angle between Upwards and Y-axis</b></p> <p>This ranges from 0 to 180 degrees. It measures the angle between the Y-axis of the device to the Upwards direction in the real world. The below image demonstrates rotations in this angle when it is facing you while mounted portrait vertically on a wall, with connector pointing down.</p>

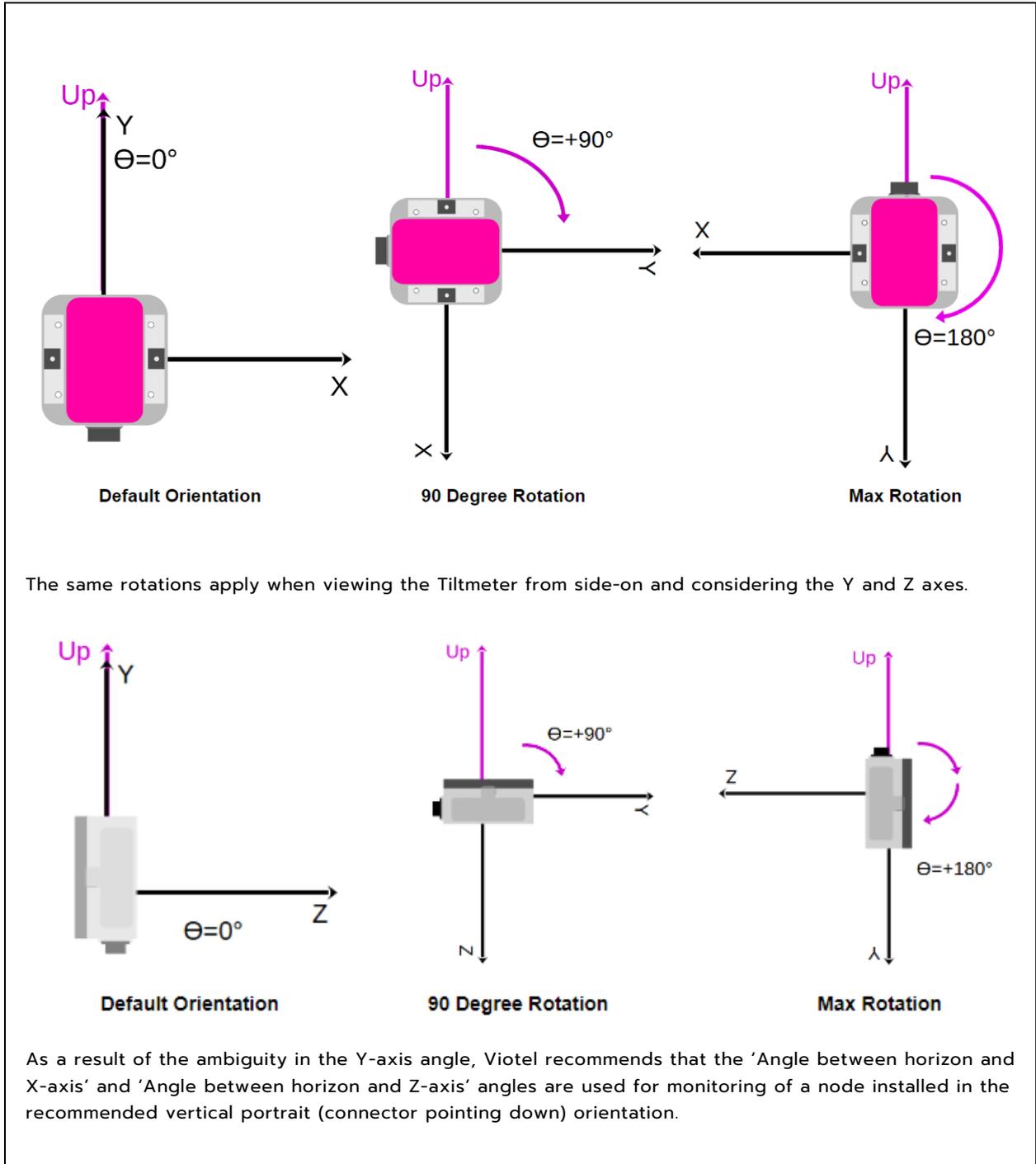


Table 3 Rotation Measurements

## 3 Operating Instructions

### 3.1 Operation

By default, your Viotel Wireless Tiltmeter Node will be set to Sleep mode. To change the mode that the tiltmeter is currently in, simply take the magnet (Part 4) and tap it on the node (position as indicated in **Section 2.1 Indicated Magnet Location**).

All operations and LED indications refer to firmware version: 3.02.14, please be aware future states may change some functionality.

TAP INSTRUCTIONS	FUNCTION	DESCRIPTION
Tap once (while in Sleep)	Query Status	This will light up a blue LED to indicate the device is currently in Sleep mode.
Tap once (while Active)	Test Shots	The device will perform 10 record-and-upload cycles of 3 minutes each. Once this data has been logged, the device will return back to its standard operation.
Tap once, Tap again within 3 seconds	Upload and change status	This will cause the device to wake up and go into Active mode. As part of this process, the node connects to the cloud and applies any new settings. The device is fully Active and recording after a few minutes.

*Table 4 How to switch between modes*

### 3.2 Initial Site Set Up

You may be installing your tilt meter at a location with access constraints, so it is important to ensure that you have set the device reading and upload to a suitable initial frequency to both suit your initial data needs and such that you can subsequently change the frequency in [myViotel](#).

If the device is initially set to a long upload time frame – for example daily uploads, it will not pick up any changes you make in myViotel until the next upload cycle. Thus we recommend initially setting the device to a high upload frequency so that you can review the data over the next few hours and then make any adjustments you desire in [myViotel](#) and the device will then reflect these changes within the next upload.

### 3.3 Adding to myViotel

Navigate to <https://my.Viotel.co> to associate the device with your myViotel account and access device management and dashboard display. The myViotel dashboard is accessible from any web browser on your computer, phone or tablet.

If you require a myViotel account or help – please contact us at [support@viotel.co](mailto:support@viotel.co)

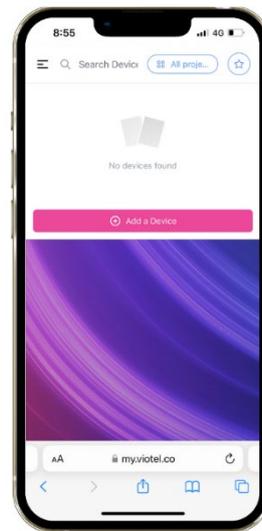
#### Step 1: Login to myViotel

Login at <https://my.viotel.co>



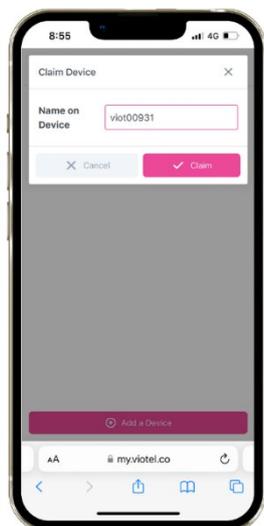
#### Step 2: Add a Device

In the *home* or *devices* tab, click **Add a Device**.



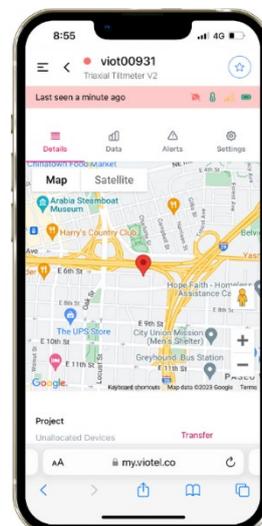
#### Step 3: Enter serial number

Type in your Viotel node **serial number** in the field provided and **claim** your device. Follow the on screen prompt. Associating the device will complete on successful communication.



#### Step 4: Set up your device

Navigate the individual device tabs to view device **details**, **data**, **alarms** and **settings**.



### 3.4 System Modes

STATUS	DESCRIPTION
Active	In this mode, the device will regularly record data at the user defined interval, check for firmware updates, monitor for user defined triggers and check for magnet inputs (Part 4).
Test Shots	This mode will set the data recording interval to 3 minutes and quickly record 10 entries along with GPS data. After approximately 30 minutes, the device will return to its Active status automatically.
Communicating	The device is currently trying to communicate with the server to download new settings, update firmware, and upload data and status information.
Sleep	The device is in power-saving mode, but will respond to any taps from the magnet (Part 4). Every 7-days, the device will initiate a connection to provide status updates and check for system updates. Then it shall return to Sleep mode unless otherwise specified by the cloud server.

Table 5 Description of Device Status

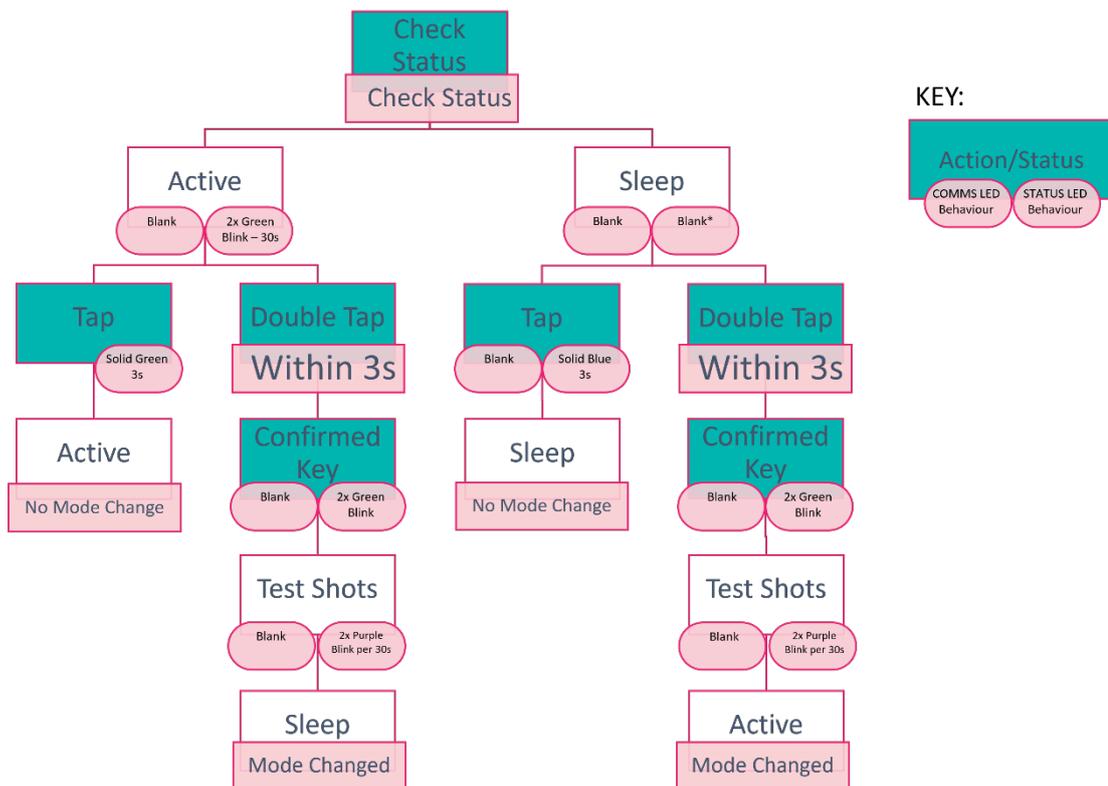


Figure 6 Flow Diagram for Cycling System Mode with the magnet

### 3.5 System Status Indicator

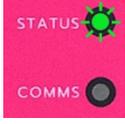
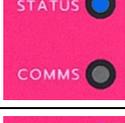
LIGHT	INTERVAL	MEANING	DESCRIPTION	VISUAL
Green Blink four times	1s	Successful Firmware Update	Firmware update requested, downloaded and installed successfully.	
Green Blink Twice (100ms)	every 30s	Active	Device is Active, running normally. See the section 3.2 System Modes for details.	
Green Blink Twice (50ms)		Status Change Confirmation	The device has confirmed that it will now switch from Sleep to Active.	
Solid Green	<3s	Status Change Confirmation	The device has confirmed that it will now switch from Active to Sleep.	
Solid Green + Yellow Blink	3s 1s	Status Change Confirmation	Device is Active and preparing to enter Test Shots mode.	
Red Blink four times	1s	Failed Firmware Update	Firmware update requested and failed to download.	
Solid Red (300ms)		Device is Busy	The device is currently busy and will not accept commands from the magnet.	
Solid Blue	3s	Sleep	Device is in Sleep mode. See the section 3.2 System Modes for details.	
Purple Blink Twice (100ms)	Every 30s	Test Shots	Device is in Test Shots mode. See the section 3.2 System Modes for details.	
Blank	N/A	Sleep	Device is in Sleep mode. See the section 3.2 System Modes for details.	

Table 6 System Status Indicator

### 3.6 System Communications Indicator

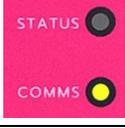
LIGHT	INTERVAL	MEANING	DESCRIPTION	VISUAL
Solid Green	1s	Communicating	The device will stop Communicating, having reported all available data.	
Yellow Blink (100ms)	Every 1s	GPS Fixing	The device is currently acquiring a GPS signal – this may take a few minutes.	
Solid Yellow	1s	GPS Fixing	The GPS signal has been acquired and successfully got a valid position.	
Solid Red (after blinking yellow sequence)	1s	GPS Fixing	The GPS signal has not been acquired and failed to get a valid position.	
Solid Red	2s	Communicating	The device has failed to connect and report data.	
Blue Blink Twice (150ms)		Communicating	The device has begun communicating, and the network has successfully connected.	
Blue Blink (150ms)		Communicating	The device is communicating, turning on its internal modem.	
Solid Blue	2s	Communicating	The device is communicating, and a successful connection to the cloud server is established.	
Green/Red Alternating		Firmware Update	Firmware update requested, downloading and installation underway.	
Blank	N/A	N/A	Device is not communicating.	

Table 7 System Communications Indicator

## 4 Maintenance

The product should not require any maintenance after installation. If the need to clean the product should arise, use only a damp cloth and mild detergent. Do not use any solvents as this may damage the enclosure.

**Only service personnel authorised by the manufacturer may open the inner (orange) enclosure. No user serviceable parts are located inside.**

### 4.1 Changing Batteries

STEP	DESCRIPTION
1	Please ensure the node is in Sleep mode (see Section 3 – Operations for details)
2	Using the T10 Torx Screwdriver, unscrew until the 4 bolts on the front of the node's enclosure are loose. Please note that the bolts are designed to remain in the device section.
3	Flip over the top half of the enclosure making the battery pack is clearly visible. Position two fingers around the battery and firmly pull up; the battery should pop out of its holder. Ensure you do not pull the red & black cables attaching the battery pack to the device.
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Figure 7 Tiltmeter with backing plate removed</p> </div> <div style="text-align: center;">  <p>Figure 8 Tiltmeter with battery removed</p> </div> </div>
4	Gently pull out the exposed plug connecting the battery to the device. Please dispose of this used battery pack correctly based on legislative requirements.
5	Gently push the new battery packs plug into the devices socket. A pair of thin needle nose pliers may be required to confirm it has been adequately plugged in.
6	Slide the battery pack into position and push firmly on the battery until it clicks into place.
7	Once the device is screwed back into the base, your node can be safely turned back to On mode for use.

## 4.2 External Power

5V DC supply is required to power your device. All electrical work must be carried out by suitably qualified technicians, and in compliance with local laws and regulations.

Power adapters can be purchased from Viotel (Viotel Part # VFN-002)

## 4.3 Downloading Data

The only way to upload data is over the cellular communications network.

If the signal is weak and the device is unable to upload data at that moment, the device is programmed to keep trying in decreasing increments (to conserve battery). If after 4 days of failing to upload, it will reboot.

Uploaded data can be viewed and downloaded from the [myViotel](#) platform.

Data is stored in non-volatile memory and survives reboots and power loss.

Data is deleted from the device once uploaded.

## 4.4 Further Support

For further support, please email our friendly staff at [support@viotel.co](mailto:support@viotel.co) with your name and number and we will get back to you.



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